

**SAMPLING AND ANALYSIS PLAN
FOR
ILLINOIS GULCH RS SITE
BRECKENRIDGE, SUMMIT COUNTY, COLORADO**

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

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For approval signatures, see Worksheet 1 & 2.

| | |
|-----------------------------------|----------------|
| Project Dates of Sampling: | 9/5-7/2017 |
| Site Spill Identifier No.: | A888 |
| Contract Name: | START IV |
| Contract No.: | EP-S8-13-01 |
| Technical Direction Document No.: | 0001/1706-15 |
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SAP Revision Log

Site: Illinois Gulch RS

OSC: Pete Stevenson

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| Date | Revision Number | Reason for Change of Scope/Procedures | SAP Section Superseded | Requested By | Approved By |
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List of Acronyms

| | |
|------------------|--|
| °C | degrees Celsius |
| %D | percent difference |
| %R | percent recovery |
| %RSD | percent relative standard deviation |
| ACM | asbestos containing material |
| AES | Atomic Emission Spectrometry |
| ANSI | American National Standards Institute |
| APP | Accident Prevention Plan |
| ARAR | applicable or relevant and appropriate requirements |
| ASQ | American Society for Quality |
| AST | aboveground storage tank |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| B | bias |
| CA | Corrective Action |
| CB | calibration blank |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CERLIS | Comprehensive Environmental Response, Compensation, and Liability System |
| CHMM | Certified Hazardous Materials Manager |
| CLP | Contract Laboratory Program |
| cpm | counts per minute |
| CO | Contracting Officer |
| COC | Chain-of-Custody |
| COR | Contracting Officer Representative |
| Cr ⁺⁶ | Hexavalent Chromium |
| CRL | Central Regional Laboratory |
| CRQL | Contract Required Quantitation Limits |
| CSM | Conceptual Site Model |
| CVAA | Cold Vapor Atomic Absorption |
| D | absolute range |
| DQI | Data Quality Indicator |
| DQO | Data Quality Objective |
| EDD | electronic data deliverable |
| EDX | Energy Dispersive X-Ray |
| ERM | Emergency Response Manager |
| ERT | Environmental Response Team |
| ESI | Expanded Site Inspection |
| FID | Flame Ionization Detector |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| GC | gas chromatography |
| GC/MS | gas chromatography/mass spectrometry |
| GIS | Geographic Information System |
| HASP | Health and Safety Plan |
| HRGC/HRMS | high resolution gas chromatography/high resolution mass spectrometry |

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List of Acronyms

| | |
|-----------|---|
| HRGC/LRMS | high resolution gas chromatography/low resolution mass spectrometry |
| HRS | Hazard Ranking System |
| HPLC | high performance liquid chromatography |
| ICB | initial calibration blank |
| ICP | inductively coupled plasma |
| IDW | investigation-derived waste |
| ISTD | Instrument Standard |
| ITRC | Interstate Technology and Regulatory Council |
| LBP | lead based paint |
| LCS | laboratory control sample |
| LOD | limit of detection |
| LOQ | limit of quantitation |
| MDL | method detection limit |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| MPC | Measurement Performance Criteria |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| NA | not applicable |
| NCP | National Contingency Plan |
| ND | non-detect |
| NIOSH | National Institute of Safety and Health |
| NPL | National Priorities List |
| NRCS | Natural Resource Conservation Service |
| PA | Preliminary Assessment |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PAL | Project Action Limit |
| PCB | Pesticides/Polychlorinated biphenyls |
| PCDD | Polychlorinated Dibenzo-P-Dioxins |
| PCDF | Polychlorinated Dibenzofurans |
| PCM | Phase Contrast Microscopy |
| P.E. | Professional Engineer |
| PID | Photoionization Detector |
| PLM | polarized light microscopy |
| PM | Project Manager |
| PMP | Project Management Professional |
| POC | Point of Contact |
| PQL | Project Quantitation Limit |
| PQO | Project Quality Objectives |
| PPE | Personal Protective Equipment |
| PT | proficiency testing |
| PTL | Project Team Lead |
| PUF | polyurethane foam |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| QMP | Quality Management Plan |

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List of Acronyms

| | |
|----------|--|
| Ra | Radium |
| RA | Risk Assessment |
| RAS | Routine Analytical Services |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| RL | reporting limit |
| RM | Removal Manager |
| RML | Removal Management Levels |
| RPD | relative percent difference |
| RSD | relative standard deviation |
| RSL | regional screening levels |
| SAP | Sampling and Analysis Plan |
| SAS | Special Analytical Services |
| SCDM | Superfund Chemical Data Matrix |
| SI | Site Inspection |
| SOP | Standard Operating Procedure |
| SRM | Standard Reference Material |
| SSL | soil screening level |
| START IV | Superfund Technical Assessment and Response Team 4 |
| SVOC | Semi-volatile Organic Compounds |
| TAL | Target Analyte List |
| TBD | to-be-determined |
| TCL | Target Compound List |
| TDD | Technical Direction Document |
| TEM | transmission electron microscopy |
| TSA | Technical Systems Audit |
| UFP-QAPP | Uniform Federal Policy–Quality Assurance Project Plan |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| U.S. EPA | United States Environmental Protection Agency |
| USGS | United States Department of the Interior Geologic Survey |
| UST | underground storage tank |
| VOC | Volatile Organic Compounds |
| WAM | Work Assignment Manager |
| WESTON | Weston Solutions, Inc. |
| XRD | x-ray diffraction |
| XRF | X-Ray Florescence |

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Introduction

This SAP identifies the data collection activities and associated QA/QC measures specific to the Illinois Gulch site (the Site) located in Breckenridge, Summit County, Colorado. All data will be generated in accordance with the quality requirements described in the Quality Assurance Project Plan for Region 8 CERCLA Removal and Emergency Response Activities in Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota (Weston 2013). The purpose of this SAP is to describe site-specific tasks that will be performed in support of the stated objectives. This SAP will reference the QAPP for generic tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment, and data review. Additional site-specific procedures and/or modifications to procedures described in the QAPP are described in the following SAP elements.

This SAP is prepared, reviewed, and approved in accordance with the procedures detailed in the QAPP. Any deviations or modifications to the approved SAP will be documented using the SAP Revision Form. This SAP is produced in accordance with the UFP for QAPPs and consists of the site-specific UFP Worksheets from the QAPP.

Project Organization and Team

Refer to the QAPP Worksheet 3 & 5, and 4, 7, & 8 for the program organizational chart, communication pathways, personnel responsibilities and qualifications, and special personnel training requirements. Project-specific information is provided below.

The following are key individuals identified for this project:

| Name | Title/Role | Organization | Receive Copy of SAP? |
|----------------|-------------------|---|----------------------|
| Robert Reed | Project Team Lead | Weston Superfund Technical Assessment and Response Team 4 (START) | Y |
| Cordel Schmidt | Project Manager | Weston Superfund Technical Assessment and Response Team 4 (START) | Y |
| Pete Stevenson | OSC | EPA On-Scene Coordinator | Y |

The individuals who will receive a copy of the Program QAPP are specified on QAPP Worksheet 3 & 5 (Project Organization and QAPP Distribution) as noted by the asterisk symbol adjacent to their names. The program QA Manager (QAPP Worksheet 4, 7 & 8) and the Project Manager will maintain the approved QA project plan consisting of the Program QAPP, Project SAP and SAP Document Review Crosswalk. The PTL will distribute the most current copy of the project QA documents via electronic or hard copy, as directed by the OSC. Files for this project will be kept in accordance with Section H.20 of Contract No.: EP-S8-13-01, stating a length of 10 years from close of the project or end of litigation.

QAPP Reference

Weston Solutions, Inc. 2013. Quality Assurance Project Plan for Region 8 CERCLA Removal and Emergency Response Activities in Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota. Prepared for the START IV Contract. July 2013.

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Worksheet 1 & 2 — Title and Approval Page

(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

1. Project Identifying Information

- a) **Site Name/Project Name:** Illinois Gulch RS
- b) **Site Location/Number:** Breckenridge, Summit County, Colorado
- c) **Contract/Work Assignment Number:** EP-S8-13-01/0001/1706-15

2) List Plans and reports from previous investigation relevant to this project.

The undersigned approves the entire UFP-QAPP document which includes this SAP and other elements that are found in the Region 8 Removal and Emergency Response QAPP (Revision 1.0).

**Lead Investigative Organization's SAP Author:
/ Project Team Leader**

Cordel Schmidt/WESTON

Printed Name/Title




8/8/2017

Signature/Date

**Lead Investigative Organization's Project
Manager:**

Cordel Schmidt/WESTON

Printed Name/Title



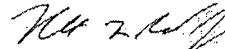
8/8/2017

Signature/Date

**Lead Investigative Organization's Technical
Manager:**

Robert L. Reed, Jr., Sr. P.M. 08/15/17

Printed Name/Title



Signature/Date

Federal Regulatory Agency OSC/Team Leader

Pete Stevenson/OSC

Printed Name/Title

Signature/Date

**Federal Regulatory Agency/ Delegated
Approval Officer:**

Printed Name/Title

Signature/Date

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Worksheet 9 — Project Planning Session Summary

(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)

(EPA 2106-G-05 Section 2.2.5)

| Date of Planning Session: 7/7/2017 | | | | |
|--|------------|--------------|--------------|------------------------------------|
| Location: Meeting On-Site | | | | |
| Purpose: Scoping meeting for Illinois Gulch RS Site | | | | |
| Name | Title/Role | Organization | Phone No. | E-mail Address |
| Pete Stevenson | OSC | EPA | 303-312-6799 | Stevenson.peter@epa.gov |
| Cordel Schmidt | PTL | WESTON | 720-474-1492 | Cordel.schmidt@westonsolutions.com |
| Rob Runkel | Scientist | USGS | 303-541-3013 | runkel@usgs.gov |

Notes/Comments: Site meeting to present site lay-out, observe surface water flow, explore for other water in-flows, discuss duties and expectations. Decisions presented below may be revised at a later date to accommodate operations.

Consensus Decisions Made:

- 2 people -samplers (USGS);
- 1 person -runner/sample delivery (EPA);
- 1 person -sample log-in/pH/cond (START);
- 2/1 people -filter/label/COC/etc for lab (START); Anticipate approx. 12 samples per hour, approx. 3 hours of sampling.
- Rob setting up lab space at USGS lab.
- START provide sample filtering equipment (peristaltic pump/tubing/filters (estimate 36 samples??), pH meter(s).
- USGS Lab to supply sample bottles/COCs/labels/coolers.
- Probably set tracer input below W1 adit.
- Filter samples with 0.45u filter

| Date of Planning Session: 8/17/2017 | | | | |
|---|------------|--------------|--------------|------------------------------------|
| Location: Meeting e-mail and telephone | | | | |
| Purpose: Lab analysis needs | | | | |
| Name | Title/Role | Organization | Phone No. | E-mail Address |
| Pete Stevenson | OSC | EPA | 303-312-6799 | Stevenson.peter@epa.gov |
| Cordel Schmidt | PTL | WESTON | 720-474-1492 | Cordel.schmidt@westonsolutions.com |

Notes/Comments: Clarification of laboratory analysis to be managed by START.

Consensus Decisions Made:

- Stevenson recommends 28 sample locations with 8 additional locations to be specified at time of sampling: therefore one sampling event, 36 samples.

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- “Cations” analysis as mentioned in Runkel email refers to “Total Metals” analysis.

Action Items:

| Action | Responsible Party | Due Date |
|---|-------------------|----------|
| START develop a SAP for tracer / synoptic sampling. Sampling to likely be performed in late August to October 2017 timeframe. | Cordel Schmidt | n/a |
| START to assist EPA and USGS during synoptic sampling activities, managed by EPA and USGS. | Cordel Schmidt | n/a |
| Develop Health and Safety Plan relevant to sampling activities. | Cordel Schmidt | n/a |

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Worksheet 10 — Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2)

(EPA 2106-G-05 Section 2.2.5)

- Problem Definition:

Historic mining operations in Summit County have created preferential pathways for ground water to interact with mineralized mine workings, exit to the surface, and enter local waterways. Water interaction with sulfide mineralization inherent in mine remnants produces an acidic solution (sulfuric acid) that removes heavy metals from the rock materials and deposits into waterways and groundwater supplies rendering the waters harmful to human health and the environment.

- Background Information/Site History:

Gold was discovered along the Blue River in 1859. The town-site of Breckenridge was founded soon after to serve the miners working the placer gold deposits around the area. Hard rock mining soon followed. Gold production decreased in the late 1800s, but revived in 1908 with the efficiency of dredge boats along the Blue River and Swan River. The Breckenridge mining district is credited with production of about one million troy ounces of gold.

The Illinois Gulch site area is forested with many roadways, houses and multi-unit dwellings that are within close proximity to the town-site of Breckenridge, a popular year-round resort destination approximately 1 mile away. Historic mine remnants in the form of old structures, adits, dumps, etc., are commonplace in the region. Elevation of the site area varies from approximately 10,000 to 10,800 feet above sea level.

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Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)

(EPA 2106-G-05 Section 2.2.6)

1. State the Problem

Ground water migrates through historic mine workings, typically in unpredictable ways, and contributes metals-contaminated water additions to surface waters and potable water supplies.

2. Identify the Goals of the Study

An understanding of groundwater flow paths from a starting point at the Willard #1 adit will aid in designing a remedial alternative to protect surface water and groundwater potable supplies.

3. Identify Information Inputs

To support the above objectives, the following data will be collected:

A synoptic surface water sampling event will be performed that will include multiple sample locations, approximately 36 samples, sampled within a uniform time frame.

Laboratory analysis will include:

- Total recoverable cations;
- Dissolved cations;
- Dissolved anions;
- Bromide;
- Alkalinity;
- Field pH, conductivity.

USGS to manage laboratory analysis for bromide.

Also, surface water sampling designed to detect a tracer placed into the water system will also be performed. Approximately three locations will be designated and equipped with an auto sampling device programmed to obtain hourly samples during the course of approximately two days. Laboratory analysis will include:

- Bromide.

USGS to manage laboratory analysis for bromide.

Synoptic event laboratory analysis will be managed by START, tracer event laboratory analysis will be managed by USGS. Analytical data results will be processed by the USGS to aid in determining groundwater flow paths/influences and present a “fingerprint” of the water at different locations.

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Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)

(EPA 2106-G-05 Section 2.2.6)

4. Define the Boundaries of the Study

Spatial boundary: The study area includes a portion of the drainage basin of Illinois Gulch above the town of Breckenridge, CO. The Willard adit and downstream flow will be included.

Temporal limit and scale of inference of the decision statement: A sampling schedule and sampling plan to include the media to be collected will be included as Worksheet 14 & 16 and Worksheet 17.

Practical constraints on data collection: Constraints on resources and time will be identified in this SAP. Field constraints may include site access, equipment, and sampling limitations due to weather conditions. Scheduling adjustments will be made if physical constraints on planned field events occur due to impacts to the technical quality of the measurements as well as safety considerations.

5. Develop the Analytic Approach

Surface water samples will be collected during a synoptic sampling approach to determine water characteristics including cations and anions. Surface water samples will also be obtained by use of auto samplers deployed by USGS for a tracer analysis. This resulting data observations will be used to guide future remedial operations at the site.

6. Specify Performance or Acceptance Criteria

Standard laboratory reporting limits are considered adequate for the purposes of this data. All data will be reviewed and verified to ensure that they are acceptable for the intended use. Data will be validated at the request of the OSC.

Decision errors will be limited to the extent practicable by following approved U.S. EPA methods and applicable SOPs listed in Worksheet #21 and Appendix B. Any deviation from the SAP will be documented.

7. Develop the Detailed Plan for Obtaining Data

As stated above, data will be collected per the sampling design and rationale provided in Worksheet 17. Sample nomenclature is described in Worksheet 17. Sample descriptions will be logged in the field logbook. Documentation of assessment activities will be entered into a site log book. Sampling data may be collected using the Scribe Mobile Application loaded onto an iPad or a Scribe compatible data dictionary on a Trimble GPS unit, as deemed most appropriate by the end user USGS. Chain of custody forms will be generated from the Scribe database. A Scribe compatible EDD will be requested from the laboratory for importing analytical results into the database.

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Worksheet 14 & 16 —Project Tasks & Schedule

(UFP-QAPP Manual Section 2.8.2)

(EPA 2106-G-05 Section 2.2.4)

| Activity | Responsible Party | Planned Start Date | Planned Completion Date | Deliverable(s) | Deliverable Due Date |
|---|-------------------|-----------------------|---------------------------|---|---------------------------|
| Develop a Draft SAP and the EPA Region 8 QA Document Review Crosswalk | WESTON | TBD | 8/11/2017 | Draft SAP and the Draft EPA Region 8 QA Document Review Crosswalk | TBD |
| Address EPA comments on Draft SAP and the Draft EPA Region 8 QA Document Review Crosswalk | WESTON | Upon receipt from EPA | Prior to initial sampling | SAP and the Final EPA Region 8 QA Document Review Crosswalk | Prior to initial sampling |
| Develop HASP | WESTON | TBD | 7/6/2017 | HASP | 7/5/2017 |
| Mobilization/Demobilization | WESTON | TBD | 9/8/2017 | Field Notes | TBD |
| Sample Collection Tasks | WESTON | 9/5/2017 | 9/8/2017 | Field Notes | n/a |
| Analytical Tasks | WESTON | TBD | TBD | Field Notes/Laboratory Reports | TBD |
| Quality Control Tasks | WESTON | TBD | TBD | Report of Analyses/Data Package | TBD |
| Validation | WESTON | TBD | TBD | Validation Summary Report | TBD |

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Worksheet 14 & 16 —Project Tasks & Schedule

(UFP-QAPP Manual Section 2.8.2)

(EPA 2106-G-05 Section 2.2.4)

| Activity | Responsible Party | Planned Start Date | Planned Completion Date | Deliverable(s) | Deliverable Due Date |
|--------------------------------------|-------------------|--------------------|-------------------------|----------------|----------------------|
| Summarize Data | WESTON | TBD | TBD | Data Report | TBD |
| Develop Report | WESTON | TBD | TBD | Draft Report | TBD |
| Address EPA comments on Draft Report | WESTON | TBD | TBD | Final Report | TBD |

Reports to management will be written and distributed in accordance with the QAPP Worksheet #6.

Worksheet 15 — Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

(UFP-QAPP Manual Sections 2.6.2.3 and Figure 15)

(EPA 2106-G-05 Section 2.2.6)

The following information will be provided for each matrix, analyte, analytical method, and concentration level (if applicable).

Matrix: Water

Analytical Method: All

Concentration level (if applicable): All

| Analyte ¹ | PAL ² | PAL Reference ² | PQL Goal | Laboratory Quantitation Limit ³ | Laboratory Detection Limit ³ |
|----------------------|------------------|----------------------------|----------|--|---|
| Cations | n/a | n/a | CRQL | CRQL | CRQL |
| Anions | n/a | n/a | CRQL | CRQL | CRQL |
| Bromide | n/a | n/a | CRQL | CRQL | CRQL |
| Alkalinity | n/a | n/a | CRQL | CRQL | CRQL |
| pH | n/a | n/a | n/a | n/a | n/a |
| Conductivity | n/a | n/a | n/a | n/a | n/a |

¹ CLP laboratories use accepted analytical methods for the isolation, detection, and quantitation of specific target compounds and analytes. The CLP TCL, TAL, and their corresponding CRQL are listed in QAPP Appendix B and QAPP Appendix C, respectively.

² Links to State regulatory cleanup standards are provided in QAPP Appendix D.

³ Terminology is project/laboratory-specific.

Worksheet 17 — Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

(EPA 2106-G-05 Section 2.3.1)

Samples will be managed in accordance with SAP Worksheet 26 & 27.

Safety

All field activities will be conducted in strict accordance with an approved Health and Safety Plan (HASP), which will be developed before the start of field activities. It is anticipated that all field work can be accomplished in Level D Personal Protective Equipment (PPE) equipment. START personnel performing sampling will wear PPE appropriate to the hazard presented. At a minimum, the following guidelines should be followed: when on site steel toed-boots shall be worn; sampling gloves and eye protection should be worn. Field crews will be cognizant of steep slopes and uneven terrain when sampling.

Sample Collection (Synoptic Sampling)

Water samples will be obtained as grab samples by dedicated personnel in a synoptic fashion along a designated length of the Illinois Gulch waterway. Sampling strategy will ensure collection in a timely manner in an effort to determine water characteristics in a “snapshot” in time. Laboratory samples will be derived from bulk samples, i.e., from large vessels, and processed on site in a secure area. Sample data will be logged into a field log book or similar electronic devise.

Sample processing on site will include water filtration with a 0.45um filter for two of the analyses. Nitric acid will be used to preserve two samples. The table below presents a summary of sample collection criteria.

| Bottle | Analysis | Filtered | Acidified (HNO3) |
|----------|------------------------|----------|------------------|
| 1x 250ml | Cations | No | Yes |
| 1x250ml | Cations | Yes | Yes |
| 1x250ml | Anions (Cl, F, SO4) | Yes | No |
| 1x250ml | Anions (Br) | Yes | No |
| 1x250ml | Alkalinity (if pH>4.2) | No | No |
| n/a | Field pH/Conductivity | No | No |

Sample Identification and Handling

Samples will be analyzed for the parameters listed in SAP Table 1. Requirements for the sample container, volume, preservation, and QC samples are included in Table 1.

Water samples will initially be placed into .5-gallon poly containers, then transferred into

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Worksheet 17 — Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

(EPA 2106-G-05 Section 2.3.1)

appropriate sample bottles for laboratory analysis. Reasoning for initial bulk samples is due to the need for a very quick and efficient synoptic sampling strategy. Sample bottles will be labeled with the sample ID in indelible ink.

Because this sampling event is being performed at a site that includes prior investigative activities, sample IDs will conform to existing site sample identification terminology that relates the sample location to specific stream segments already established. Or may be labeled as: “IG” indicating the sample was derived from the Illinois Gulch, or W1 indicating the Willard Adit 1; Followed by a location number; Followed by a media designation “SW” for surface water; Followed by a the date of collection “MMDDYYYY”.

Example: sample IG-17-SW-08202017 will indicate Illinois Gulch, water sample location 17, surface water collected on August 20, 2017. Note that sample labeling terminology will be determined at the time of sample collection by EPA with preference given to USGS needs.

Sample collection method (grab vs. composite), water parameters, location, etc., will be recorded in the field logbook.

Samples will be analyzed for the parameters listed on Worksheet 15. In addition, requirements for the sample container, volume, preservation, and QC samples are listed on Worksheet 19 & 30 of the QAPP. Table 1 summarizes the information from Worksheet 15 and Worksheet 19 & 30.

Sampling Logistics and Contingencies

- *Site Location and Weather Considerations*

Because the sampling event is planned for a summer month in mountainous terrain a weather delay could be caused by a severe rain/hail event. If that occurs the sampling activities will be delayed long enough to allow for safe sample collection. Site access has been approved by EPA for all sampling locations.

- *Sampling Schedule Considerations*

Samples will be tested and sent to the laboratory to meet the deadlines outlined in SAP Worksheet 14 & 16.

- *Sample Information Importance and Data Variability*

The purpose of this sampling is outlined in SAP Worksheet 11.

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Worksheet 17 — Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

(EPA 2106-G-05 Section 2.3.1)

This sampling event is focused on water quality characteristics related to cations and anions in the water, as well as the detection of an induced bromide tracer compound.

Surface water samples will be obtained as grab samples and considered to be fully homogenized.

- *Potential Sampling Problems and Corrective Action*
 - a. Personnel will be dedicated to specific sample locations and will deliver bulk samples to a central sample processing location where the bulk samples will be apportioned into distinct laboratory sample bottles. Because of the timeliness of the synoptic sampling strategy if a sample is lost or destroyed it may not be recovered.
 - b. Any changes from the planned equipment or methods will be documented in the field logbook.

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Worksheet 18 — Sampling Locations and Methods

(UFP-QAPP Manual Section 3.1.1 and 3.1.2)

(EPA 2106-G-05 Sections 2.3.1 and 2.3.2)

| Sampling Location / ID | Matrix | Depth (inches) | Type | Analyte/Analytical Group | Sampling SOP Reference ¹ | Comments |
|------------------------|--------|----------------|------|-----------------------------|-------------------------------------|---------------|
| IG-##-SW-MMDDYYYY | Water | Variable | Grab | Cations, Anions, Alkalinity | 2013 | Surface Water |
| | | | | | | |
| | | | | | | |

¹ Sampling SOPs references will be provided in Worksheet 21.

Worksheet 19 & 30 — Sample Containers, Preservation, and Hold Times

(UFP-QAPP Manual Section 3.1.2.2)

(EPA 2106-G-05 Section 2.3.2)

| Matrix | Analyte/ Analyte Group | Method/ SOP ¹ | Accreditation Expiration Date | Container(s) (number, size & type per sample) ² | Preservation | Preparation Holding Time | Analytical Holding Time | Data Package Turnaround |
|--------|---|-----------------------------|-------------------------------------|--|--|-----------------------------|-------------------------------|-------------------------------|
| Water | Cations, Total Recoverable | EPA 200.7/200.8 | TBD | One 250 ml poly bottle | HNO ₃ to pH < 2 and store @ < 4°C | 180 days | 180 days | TBD |
| | Cations, Dissolved | EPA 200.7/200.8 | TBD | One 250 ml poly bottle | HNO ₃ to pH < 2 and store @ < 4°C | 180 days | 180 days | TBD |
| | Anions, Dissolved (Cl, F, SO ₄) | EPA 300.0 | TBD | One 250 ml poly bottle | Store @ < 4°C | 28 days | 28 days | TBD |
| | Bromide, Dissolved | USGS | TBD | One 250 ml poly bottle | Store @ < 4°C | 28 days | 28 days | TBD |
| | Alkalinity | EPA 310.1 | TBD | One 250 ml poly bottle | Store @ < 4°C | 14 days | 14 days | TBD |

¹ Refer to the Analytical SOP References table (Worksheet 23).

² The minimum sample size is based on analysis allowing for sufficient sample for reanalysis. Additional volume is needed for the laboratory MS/MSD sample analysis.

³ Refers to requirements after processing of aquatic animal tissue by laboratory.

Worksheet 20 — Field Quality Control Sample Summary

(UFP-QAPP Manual Sections 3.1.1 and 3.1.2)

(EPA 2106-G-05 Section 2.3.5)

| Matrix | Analyte/Analytical Group | No. of Field Samples ¹ | No. of Field Duplicates | No. of MS/MSD | No. of Field Blanks | No. of Equip. Blanks | No. of Trip Blanks | No. of Other | Total No. of Samples to Laboratory |
|--------|--------------------------|-----------------------------------|-------------------------|------------------------------------|---------------------|----------------------|--------------------|--------------|------------------------------------|
| Water | Cations, Total | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 0 | 0 | 0 | 44 |
| Water | Cations, Dissolved | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 0 | 0 | 0 | 44 |
| Water | Anions | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 0 | 0 | 0 | 44 |
| Water | Alkalinity | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 0 | 0 | 0 | 44 |

¹ Samples that are collected at different depths at the same location, and analyzed separately, will be counted as separate field samples. Even if they are taken from the same container as the parent field sample, MS/MSDs are counted separately, because they are analyzed separately. If composite samples or incremental samples are collected, only the sample that will be analyzed will be included; subsamples and increments will not be listed separately.

The number and types of QC samples will be based on project-specific DQOs and this worksheet will be adapted, as necessary, to accommodate project-specific requirements. Project-specific QC samples may include field duplicate, field blank, equipment blank, trip blank, field split, MS/MSD, and PT samples and will be collected in accordance with the frequencies recorded on QAPP Worksheet 12.

Quality Assurance Assessment and Corrective Actions are found in QAPP Worksheet #28.

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Worksheet 21 — Field SOPs
 (UFP-QAPP Manual Section 3.1.2)
 (EPA 2106-G-05 Section 2.3.2)

| SOP Number or Reference | Title, Revision, Date, and URL (if available) | Originating Organization | SOP Option or Equipment Type (if SOP provides different options) | Modified for Project? Y/N | Comments |
|-------------------------|---|--------------------------|--|---------------------------|---------------------------------------|
| 2013 | Surface Water Sampling, 6/2011 | U.S. EPA, ERT | n/a | <Y/N> | SOPs are available in QAPP Appendix I |
| 2001 | General Field Sampling Guidelines, 6/2011 | U.S. EPA, ERT | n/a | <Y/N> | SOPs are available in QAPP Appendix I |

For purposes of this SAP, investigation-derived wastes (IDW) are defined as any byproduct of the field activities that is suspected or known to be contaminated with hazardous substances. The performance of field activities will produce waste products, including spent sampling supplies (disposable tubing/filters) and expendable PPE.

IDW will be managed in accordance with EPA Guide to Management of Investigation Derived Wastes (EPA 1992). Spent sampling supplies and expendable PPE are not anticipated to be considered a hazardous and will be containerized and disposed of in the municipal waste system.

Worksheet 22 — Field Equipment Calibration, Maintenance, Testing, and Inspection

(UFP-QAPP Manual Section 3.1.2.4)

(EPA 2106-G-05 Section 2.3.6)

<Eliminate SOPs that are not applicable to the site.>

| Field Equipment | Calibration Activity | Maintenance Activity | Testing Activity | Inspection Activity | Frequency | Acceptance Criteria | Corrective Action | Title or Position of Responsible Person | Verification | SOP Reference ¹ |
|--|------------------------------------|---|---|--|--------------|-----------------------|-------------------|---|------------------------------------|---|
| Field Equipment | Calibration Activity | Maintenance Activity | Testing Activity | Inspection Activity | Frequency | Acceptance Criteria | Corrective Action | Title or Position of Responsible Person | Verification | SOP Reference ¹ |
| Oakton pH meter or similar | Two point calibration prior to use | Clean prior and after each use, check battery | Calibration and operational equipment check | Visually inspect for obvious defects, broken parts, or cleanliness | Prior to use | Equipment operational | Repair/ | Oakton pH meter | Two point calibration prior to use | Clean prior and after each use, check battery |
| Sampling Tools (Disposable tubing) | NA | NA | NA | Visually inspect for obvious defects or broken parts | Prior to use | NA | Replace | Field personnel | WAM/COR | NA |
| Disposable, inert sample mixing containers | NA | NA | NA | Visually inspect for cleanliness | Prior to use | NA | Replace | Field personnel | WAM/COR | NA |

¹ Refer to Field SOPs (Worksheet 21) and Analytical SOPs (Worksheet 23).

Worksheet 23 — Analytical SOPs

(UFP-QAPP Manual Section 3.2.1)

(EPA 2106-G-05 Section 2.3.4)

| Lab SOP Number ¹ | Title, Revision Date, and/or Number and URL (if available) | Screening or Definitive Data | Matrix/Analytical Group | SOP Option or Equipment Type | Modified for Project? (Y/N) |
|-----------------------------|--|------------------------------|-------------------------|------------------------------|-----------------------------|
| TBD | METHOD EPA 300.0 Determination of Inorganic Anions by Ion Chromatography https://www.epa.gov/sites/production/files/2015-08/documents/method_300-0_rev_2-1_1993.pdf | Definitive | Water | IC | TBD |
| TBD | METHOD EPA 200.7/200.8 Determination of Trace Elements in Waters and Wastes https://www.epa.gov/sites/production/files/2015-06/documents/epa-200.8.pdf | Definitive | Water | ICP/MS | TBD |
| TBD | METHOD EPA 310.1 Alkalinity (Titrimetric, pH 4.5) http://www.caslab.com/EPA-Methods/PDF/EPA-Method-3101.pdf | Definitive | Water | Titration | TBD |

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Worksheet 24 — Analytical Instrument Calibration

(UFP-QAPP Manual Section 3.2.2)

(EPA 2106-G-05 Section 2.3.6)

As stated in Worksheet 22, WESTON field personnel are responsible for the calibration of WESTON and sub-contractor provided analytical field equipment. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by U.S. EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted.

The responsibility for the calibration of laboratory equipment rests with the selected laboratories. Each type of instrumentation and each U.S. EPA-approved method have specific requirements for the calibration procedures, depending on the analytes of interest and the sample medium. The calibration procedures and frequencies of the equipment used to perform the analyses will be in accordance with requirements established by the U.S. EPA. The laboratory QA manager will be responsible for ensuring that the laboratory instrumentation is maintained in accordance with specifications. Individual laboratory SOPs will be followed for corrective actions and preventative maintenance frequencies. Laboratory quality control, calibration procedures, corrective action procedures, and instrument preventative maintenance will be included in an addendum to this QAPP once the laboratories have been selected for each of the TBA sites. Items may include, but are not limited to those identified in the table below.

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Worksheet 24 — Analytical Instrument Calibration

(UFP-QAPP Manual Section 3.2.2)

(EPA 2106-G-05 Section 2.3.6)

| Instrument | Calibration Procedure | Frequency of Calibration | Acceptance Criteria | Corrective Action | Title/Position Responsible for CA | SOP Reference ¹ |
|----------------|---------------------------------|--|--|--|-----------------------------------|-----------------------------|
| ICP/ ICP-MS | See 6010C, 6020A, ISM01.3 | Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verification 10% or every 2 hours, whichever is more frequent | Calibration $r^2 > 0.995$; initial and continuing calibration verification within $\pm 20\%$ of true values | Inspect system; correct problem; re-run calibration and affected samples | Lab Manager/ Analyst | 6010C, 6020A, ISM01.3 |
| IC | 300 | Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verifications. Upper range within 10%. New upper range limits should be determined whenever a significant change in instrument response or every six months. Low-level continuing calibration verification (LLCCV) standard with 30%. | Initial and continuing calibration verification within $\pm 10\%$ of upper range true values and $\pm 30\%$ LLCCV true values. | Inspect system; correct | Lab Manager/ Analyst | 300 |

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Worksheet 26 & 27 — Sample Handling, Custody, and Disposal

(UFP-QAPP Manual Section 3.3)

(EPA 2106-G-05 Manual Section 2.3.3)

Examples of field form (QAPP Appendix F), chain-of-custody (QAPP Appendix G), and sample label and custody seal (QAPP Appendix H) documentation are in the QAPP. SOPs for sample handling are identified below and are located in QAPP Appendix I.

Sampling Organization: WESTON

Laboratory: TBD

Note –The OSC will review and approve the SAP prior to proceeding with lab procurement. Therefore this information will not be available until the lab procurement has been finalized.

Method of sample delivery (shipper/carrier): Hand Carried or shipped via FedEx

Number of days from reporting until sample disposal: 180

| Activity | Organization and Title or Position of Person Responsible for the Activity | SOP Reference |
|--------------------------------------|--|--|
| Sample Labeling | START Field Personnel | QAPP Appendix I, SOP G-1 & G-3 |
| Chain-of-Custody Form Completion | START Field Personnel | QAPP Appendix I, SOP G-8 |
| Sample Packaging | START Field Personnel | QAPP Appendix I, SOP G-9 |
| Shipping Coordination | START Field Personnel | QAPP, Appendix I, SOP G-9 |
| Sample Receipt, Inspection, & Log-in | Laboratory Sample Custodian | Laboratory SOP |
| Sample Custody and Storage | Laboratory Sample Custodian /Laboratory Analytical Personnel | Laboratory SOP |
| Sample Disposal | START Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel | QAPP Appendix I, SOP G-1 & G-3 Laboratory SOP |

Supplies and consumables can be received at a WESTON office, U.S. EPA Warehouse or at a site. When supplies are received at a WESTON office or U.S. EPA Warehouse, the PM or PTL will sort the supplies according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before the supplies are accepted for use on a project. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order. The item will then be returned to the vendor for replacement or repair. Procedures for receiving supplies and consumables in the field are similar to those described above. Upon receipt, items will be inspected by the WESTON PM or PTL against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

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Worksheet 36 — Data Validation Procedures

(UFP-QAPP Manual Section 5.2.2)

(EPA 2106-G-05 Section 2.5.1)

Data Validator: WESTON

| Analytical Group/ Method | Data Deliverable Requirements | Analytical Specifications | MPC | Percent of Data Packages to be Validated | Percent of Raw Data Reviewed | Percent of Results to be Recalculated | Validation Procedure | Validation Code ¹ | Electronic Validation Program/ Version |
|--------------------------|-------------------------------|---------------------------|----------------------------|--|------------------------------|---------------------------------------|----------------------|------------------------------|--|
| All | TBD | TBD | Worksheets 11, 12, 19 & 30 | TBD | TBD | TBD | TBD | TBD | TBD |

¹ Validation Codes are provided in QAPP Appendix M.

Validation will be performed on all laboratory analytical data unless a defined quantity or percentage of samples is identified by the U.S. EPA in the Technical Direction Document or during the project scoping meeting on a project-specific basis.. Project validation criteria as per QAPP Worksheets 12, 15, 19 & 30, 28, and 36, and cited EPA SW-846 methodology will be used. WESTON-contracted laboratory data packages will be verified and validated using a Stage 2A validation, as described in the EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009) (QAPP Appendix J) unless otherwise specified by the U.S. EPA WAM/COR during the development of the DQOs. Validation Qualifiers will be applied using the following hierarchy: Region 8 UFP-QAPP for Removal Actions and Emergency Responses; the site-specific SAP, and/or QAPP; *EPA National Functional Guidelines for Organic Data Review* (QAPP Appendix K); *EPA National Functional Guidelines for Inorganic Data Review* (QAPP Appendix L); EPA Publication SW-846; and the laboratory-specific SOP. Methods for which no data validation guidelines exist will be validated following the guidance deemed most appropriate by the data validator.

The data validator will receive all laboratory packages and analytical results electronically. Additionally, the validator will be required to submit final validation reports via PDF format and must provide an annotated laboratory analytical result EDD with applicable data validation qualifiers (QAPP Appendix M) identified in the site-specific SAP, and/or QAPP, and/or result value modifications. The Delegated QA Manager will use EPA document *Using Qualified Data to Document an Observed Release and Observed Contamination* (July 1996) to aid in determining the use of qualified data to document all observed release and observed contamination by chemical analysis under U.S. EPA's HRS. Approved data will be released by the Delegated QA Manager for reporting.

QAPP Worksheet 35 describes the issue resolution process and the individual responsible for conveying results to data users. For issues internal to the laboratory, the laboratory PM will be the responsible party for data resolution issues and will be responsible for conveying

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Worksheet 36 — Data Validation Procedures

(UFP-QAPP Manual Section 5.2.2)

(EPA 2106-G-05 Section 2.5.1)

this information to the Delegate QA Manager or delegated authority. For external laboratory data and quality issues, the Delegated QA Manager or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the Delegated QA Manager, delegated authority, or other persons identified in the table in QAPP Worksheet 35 will be responsible for issue resolutions of such items and will be the responsible party for conveying that information to data users.

TABLES

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Table 1
Sampling and Analysis Summary

Site: Illinois Gulch RS
OSC: Pete Stevenson
TDD: 0001/1706-15

| Matrix | Analytical Parameter | Analytical Method | Containers (Numbers, Size, and Type) | Preservation Requirements | Number of Sampling Locations | Number of Field Duplicates | Number of MS/MSDs ² | Number of Blanks (Trip, Field, Equipment, Rinsate) ¹ | Total Number of Samples to Lab ³ | Holding Time |
|--------|----------------------------|-------------------|--------------------------------------|--|------------------------------|----------------------------|------------------------------------|---|---|--------------|
| Water | Cations, Total Recoverable | EPA 200.7/200.8 | One 250ml Poly Bottle | HNO ₃ to pH < 2 and store @ < 4°C | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 44 | 180 day |
| Water | Cations, Dissolved | EPA 200.7/200.8 | One 250 ml poly bottle | HNO ₃ to pH < 2 and store @ < 4°C | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 44 | 180 day |
| Water | Anions, Dissolved | EPA 300.0 | One 250 ml poly bottle | Store @ < 4°C | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 44 | 28 day |
| Water | Bromide | In-House USGS | One 250 ml poly bottle | Store @ < 4°C | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 44 | 28 day |
| Water | Alkalinity | SM 2320B-2011 | One 250 ml poly bottle | Store @ < 4°C | 36 | 4 | 1 per extraction batch, estimate 2 | 2 | 44 | 14 day |

Notes:

¹ Trip blanks are only required for VOCs in water samples.

samples.

² For the samples designated for MS/MSDs, triple volume is required for VOCs and double volume for other water parameters.

³ Total number of samples to the laboratory does not include MS/MSD

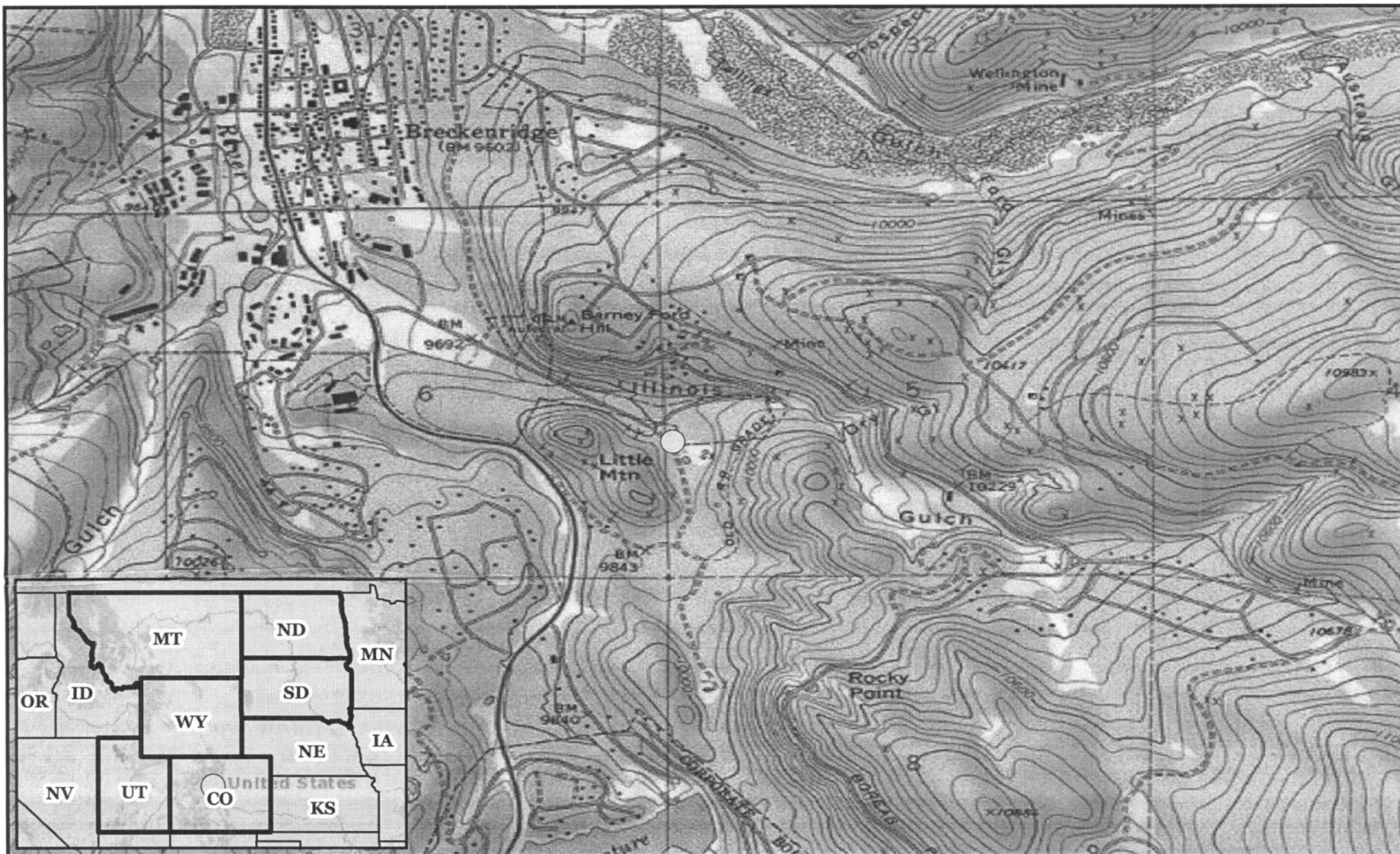
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FIGURES

Figure 1: Site Location Map

Figure 2: Sample Location Map

W0502.1E.01392



Coordinate System: GCS WGS 1984
Datum: WGS 1984

Source:
Site Location: Georeferenced Aerial (2017)
Background: ESRI USA Topo Maps (2017)

0 0.25 0.5 1 Miles

Legend:

○ Site Location



Prepared for:
U.S. EPA - Region 8

Contract: EP-S8-13-01
TO/TDD: 0001/1706-15

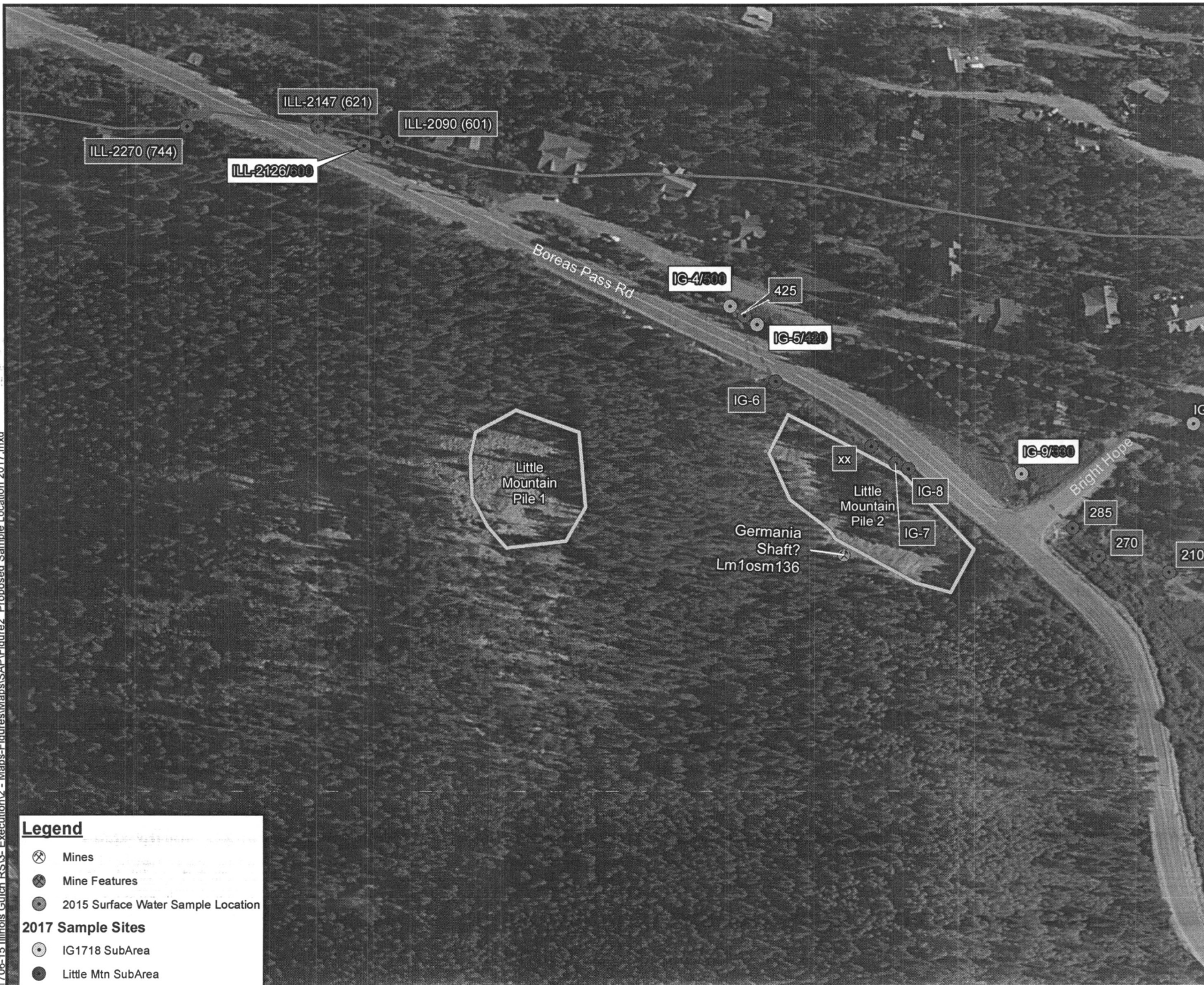
Prepared By:
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Lakewood, CO



FIGURE 1
SITE LOCATION MAP
ILLINOIS GULCH RS SITE
BRECKENRIDGE, COLORADO

Date: 8/14/2017

1706-15 Illinois Gulch RS13- Execution2 - Maps-Figures\Maps\SAP\Figure2- Proposed Sample Location 2017.mxd



ATTACHMENTS

EPA Region 8 QA Document Review Crosswalk

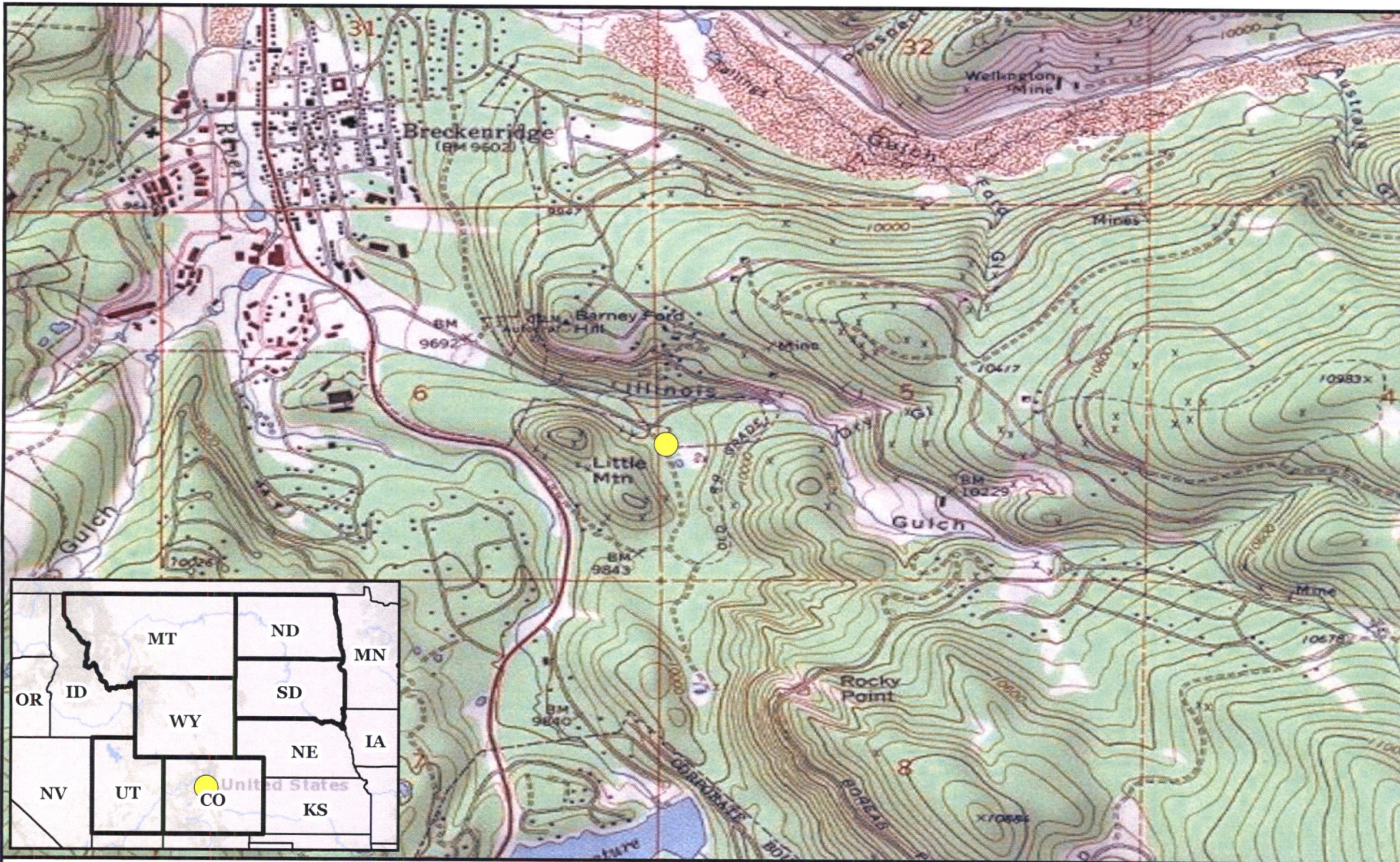
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PCL XL error

Subsystem: VECTOR

Warning: IllegalMediaSize



Coordinate System: GCS WGS 1984
Datum: WGS 1984

Source:
Site Location: Georeferenced Aerial (2017)
Background: ESRI USA Topo Maps (2017)

Legend:

 Site Location

0 0.25 0.5 1 Miles



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TO/TDD: 0001/1706-15

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**FIGURE 1
SITE LOCATION MAP
ILLINOIS GULCH RS SITE
BRECKENRIDGE, COLORADO**

Date: 8/14/2017

Path: R:\TDDs\0001-1706-15 Illinois Gulch RS\3-Execution\2 - Maps-Figures\Maps\SA\PFigure2 - Proposed Sample Location 2017.mxd



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Contract: EP-S8-13-01
TO/TDD: 0001/1706-15

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FIGURE 2
SAMPLE LOCATION MAP
ILLINOIS GULCH RS SITE
BRECKENRIDGE, COLORADO

Date: 8/17/2017